New species and records of Mediterranean Philodromidae (Arachnida, Araneae): I. *Philodromus aureolus* group

Ch. Muster & K. Thaler

Abstract: New species and records of Mediterranean Philodromidae (Arachnida, Araneae): I. *Philodromus aureolus* group. 13 of the 15 species of the *Philodromus aureolus* group known from the western Palaearctic region have been shown to occur around the Mediterranean. Among them are three new species: *Ph. bosmansi* nov. sp., *Ph. krausi* nov. sp. and *Ph. lunatus* nov. sp. The results show that the diversity of this group in the Mediterranean region has been underestimated, but that this diversity can be crucial for assessing intra- and interspecific variability in temperate zones. All relevant species are illustrated and discussed, and a determination key is provided. Most members of the group are widely distributed in southern Europe, but some appear confined to more restricted areas such as *Ph. lividus* in the western and *Ph. lunatus* nov. sp. in the eastern Mediterranean, respectively, *Ph. krausi* nov. sp. in Asia Minor and *Ph. bosmansi* nov. sp. in the Atlas mountains of Algeria. The temperate species *Ph. aureolus*, *Ph. cespitum*, *Ph. collinus* and *Ph. vagulus* are dispersed and occur at climatically less favoured localities only. Phylogenetic relationships within the group remain unresolved. The following new subjective synonyms are proposed: *Ph. collinus istricus* Braun 1965 = *Philodromus collinus* C. L. Koch 1835; *Ph. aureolus rufolimbatus* Kulczynski 1891 = *Philodromus fuscolimbatus* Lucas 1846.

Key words: *Philodromus*, taxonomy, descriptions, Mediterranean region, biogeography.

Introduction

Separation of species and their identification in the *aureolus* group of the philodromid genus *Philodromus* has always been difficult, albeit the most common representatives having been named already in 1757 and 1802. In early faunal works (Simon 1875; Chyzer & Kulczynski 1891) many more taxa are distinguished than were acknowledged 50 year later (Simon 1932; Tullgren 1944; Palmgren 1950; Locket & Millidge 1951). This „lumping" probably resulted from intraspecific variation in pattern and colours, overall similarity of genital organs and also sympatric occurrence. For example, material identified by Simon as one species of this complex, recently revealed the presence of not less than four species (Segers 1992: 23). *Philodromus aureolus* was believed to exhibit exceptionally high variation.

„*P. aureolus* est variable de coloration; chez le male les apophyses tibiales, chez la femelle la fossette génitale, sont aussi un peu variables; plusieurs de ses formes ont recu des noms mais je renonce à les faire figurer ici à cause du trop grand nombre de transitions qui les relient; les differences signalées dans les organes sexuels sons assez légères et paraissent plutot individuelles que subspécifiques" (Simon 1932: 851).

„Gleich Tullgren habe ich es als unmöglich angesehen, auch nur einigermassen konstante und miteinander nicht durch gleitende Übergänge verbundene Formen dieser Art festzustellen, aber es scheint mir nicht ausgeschlossen, dass die Untersuchung eines grossen ... Materials bestimmte Biotop- bzw. Merkmalskorrelationen erschliessen könnte, seien sie nun phäno- oder genotypischen Charakters" (Palmgren 1950: 30).

Nevertheless, in this group, specific differences in genital characters also exist, which are minute but discrete. This was

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shown first by BRAUN (1965) in a subtile revision, in which he convincingly separated *Ph. aureolus* and *Ph. cespitum*. Since then, *Ph. praedatus* has been re-allocated specific rank by LOCKET et al. (1974). Problems remained with the taxa described by SIMON and KULCZYNSKI, due to shortage of material from southern Europe. This situation was substantially improved by SEGERS (1992), who re-installed three species described by LUCAS and by SIMON, in the framework of an overview of the west Palaearctic members of the group. Nevertheless information about presence and distribution of these species in the Mediterranean region is still scanty.

It was therefore of interest, to examine the material of the *Ph. aureolus* group in the collections which have been accumulated over the last decades by K. THALER & B. KNOFLACH and R. BOSMANS. Most specimens originate from the poorly investigated eastern Mediterranean: Italy (northwards to the southern slope of the Alps), Greece, Turkey. Due to the sampling efforts of R. BOSMANS in Algeria, data from northern Africa could also be included. Few records are added from Spain, France, Croatia, Macedonia, Bulgaria and Iran. Some specimens kept in the Roewer collection (SMF) also have been re-examined. Nine of the ten species accepted as valid by SEGERS (1992) have been identified, together with three new species and another species described by KUBCOVÁ (this volume). We also decided to include brief comments on the remaining species known from the west Palaearctic (*Ph. bonneti*, *Ph. marmoratus*), and to prepare a key.

Terminology

Genital structures were extensively discussed in German by BRAUN (1965). There seems to be general agreement in terminology concerning tibial apophyses and the palpal organ (Fig. 1). Four terms used in this paper should be explained: cymbial process, a small projection at the retrolateral proximal ventral border of cymbium (= "paracymbiale Lamelle" [BRAUN], "tutaculum" [LEVY 1977: 196]); retrolateral tegular projection (= "seitliche Tegulumüberlappung" [BRAUN]); embolar base (= "Truncus" [BRAUN]); sperm duct (= "Spermophor + Ductus ejaculatorius" [BRAUN], "receptaculum seminis" [SCHICK 1965]). In the ventral view of the tegulum, the sperm duct forms a distinct loop, which, roughly, can be divided into an ascending (proximal) part, an intermediate part and a descending (distal) part. The loop is, in most species, rather symmetric, with a straight axis and, in some species, strongly asymmetric with the main axis broken.

For females, terminology is more controversial. The epigyne (Fig. 25a) shows a median septum (= "Epigynenzunge" [BRAUN]), which, laterally, is accompanied by sclerotized epigynal folds (= "costae corneae epigynes" [CHYZER & KULCZYNSKI 1891: 103]), each fold forming a distinct rim (= "Rand der Epigynenzunge" [BRAUN]). In the septum the posterior median plate can be distinguished from the anterior atrium (= "depression", [DONDALE 1961]), which in most species is clearly excavated, the bend forming a sclerotized arch ("Chitinbrücke" [BRAUN]). Introductory orifices open at the sides of the atrium and are covered by the anterior parts of the epigynal folds. Copulatory ducts (Fig. 25b) (= "Receptacularröhre" [BRAUN], "c. duct" [DONDALE & REDNER 1976]) are rather short, heavily sclerotized, with a glandular head near the orifice, projecting anteriorly to an internal fold (= "Chitinkappe des Orificiums" [BRAUN]). The receptacula show distinct glandular mounds (= "kammförmige Drüse" [BRAUN]). The function of genitalia in one species of this group has been described by HUBER (1995). It should be noted that, in females, the atrium is occasionally covered by amorphous material of unknown origin, probably forming a mating plug.

Material and methods

Specimens from private and museum collections have been examined. **Depository**: CB = R. BOSMANS, CK = L. KUBCOVÁ, CM = C. MUSTER, CTh = K. THALER & B. KNOFLACH, KBIN = Koninklijk Belgisch Instituut voor Natuurwetenschappen Brussels, LI = Biologiezentrum der OÖ. Landesmuseen, MHNG = Muséum d' Histoire naturelle Genéve, MNHN = Muséum d' Histoire naturelle Paris, MTD = Museum für

Tierkunde Dresden, NMW = Naturhistorisches Museum Wien, SMF = Forschungsinstitut Senckenberg, Frankfurt a. M. If not stated otherwise, all material is in the collection of K. THALER & B. KNOFLACH.

Abbreviations: CL = carapace length, CW = carapace width, CYL = cymbium length, CYW = cymbium width, ITA = intermediate tibial apophysis, RTA = retrolateral tibial apophysis, VTA = ventral tibial apophysis, see also legends of Figures 1, 2, 25.

Epigynes/vulvae have been embedded 15 min in HOYER's solution (KRAUS 1984) before examination. All measurements are in mm.

Taxonomic part

Key to species of *Philodromus aureolus* group in the Mediterranean region

(not included: *Ph. bonneti*)

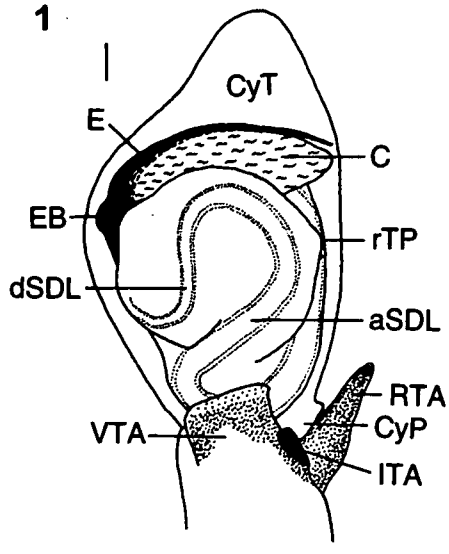
Males

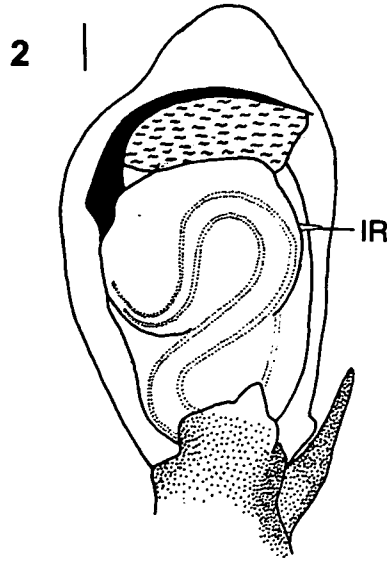
1 ITA absent; VTA long and slender, narrowed at its base (Fig. 9) ..... *Ph. collinus*
– ITA present; VTA wider than long, not narrowed at its base 2
2 RTA short, truncate, wider than long ..... *Ph. vagulus*
– RTA forming an elongate spur (Fig. 1, 2, 6–14) 3
3 Retrolateral tegular projection conspicuous; VTA triangular 4
– Retrolateral tegular projection less developed; if tegulum bulged, VTA not triangular 5
4 Retrolateral tegular projection spur-like; embolus short, falciform ..... *Ph. buxi*
– Retrolateral tegular projection triangular; embolus long ..... *Ph. marmoratus*
5 Embolus long, originating at proximal half of tegulum (Fig. 6) ..... *Ph. lunatus* nov. sp.
– Embolus shorter, originating at anterior half of tegulum 6
6 Embolus sharply bent in its proximal part (Fig. 8, 12, 14) 7
– Embolus smoothly curved 9
7 Embolus originating at anterior inner edge of tegulum; ITA inconspicuous; RTA truncate (Fig. 14) ..... *Ph. lividus*
– Embolus originating subdistally; ITA well-developed; RTA tapering 8
8 Loop of sperm duct conspicuously asymmetric, descending part pointing to cymbial process (Fig. 12, see arrow) ..... *Ph. cespitum*
– Loop of sperm duct diagonal, descending part almost parallel to longitudinal axis of cymbium (Fig. 8, see arrow) ..... *Ph. praedatus*
9 VTA quadrangular, its anterior border straight, almost transverse (Fig. 1, 7, 11) 10
– VTA triangular or trapeziform, anterior border oblique (Fig. 2, 10, 13) 12
10 ITA prominent (Fig. 11); cymbial process forming a tip ..... *Ph. krausi* nov. sp.
– ITA as a low crest (Fig. 1, 7); cymbial process forming a transparent lamina 11
11 RTA pointing retrolaterally, standing away from cymbium (Fig. 7) ..... *Ph. buchari*
– RTA pointing more anteriorly, almost touching cymbial process (Fig. 1) ..... *Ph. aureolus*
12 Dorsal border of RTA straight to convex ..... *Ph. fuscolimbatus*
– Dorsal border of RTA concave 13
13 RTA with distinct step; ITA large, standing at base of VTA (Fig. 10) ..... *Ph. longipalpis*
– RTA smooth, conspicuously pointed (Fig. 5); ITA as a small, lateral projection of VTA (Fig. 2) ..... *Ph. bosmansi* nov. sp.

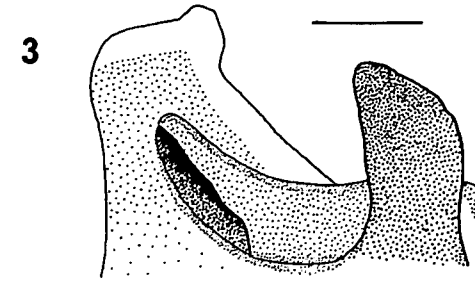
Females

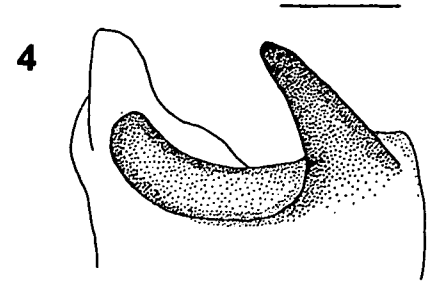
1 Atrium of epigyne divided by a triangular projection of median plate (Fig. 23a); receptacula surpassing copulatory ducts anteriorly (Fig. 23b) ..... *Ph. collinus*
– Atrium undivided; copulatory ducts well visible in front of receptacula 2
2 Epigyne without sclerotised arch (Fig. 16a, 19a, 24a) 3
– Epigyne with sclerotised arch between introductory orifices (Fig. 17a, 18a, 21a, 22a, 25a), sometimes indistinct (15a, 20a) 6
3 Atrium nearly as wide or wider than median plate (Fig. 24a) 4
– Atrium distinctly narrower than median plate (Fig. 16a, 19a) 5
4 Median septum narrow, 3–4 times longer than wide ..... *Ph. vagulus*
– Median septum broad, approximately 1.5 times longer than wide (Fig. 24a) .. *Ph. bosmansi* nov. sp.
5 Receptacula bulbous, copulatory ducts approximately 2 times length of receptacula (Fig. 16b) ... *Ph. aureolus*
– Receptacula egg-shaped, copulatory ducts at most 1.5 times length of receptacula (Fig. 19b) .... *Ph. lunatus* nov. sp.

6	Epigynal folds straight, diverging strongly anteriorly	*Ph. marmoratus*
–	Epigynal folds S-shaped	7
7	Sclerotised arch inconspicuous, hardly visible in undissected epigyne (15a, 20a)	8
–	Sclerotised arch distinct (Fig. 17a, 18a, 21a, 22a, 25a)	9
8	Receptacula relatively small, copulatory ducts >2 times diameter of receptacula; glandular mounds inconspicuous (Fig. 15b)	*Ph. praedatus*
–	Receptacula relatively larger, copulatory ducts <2 times diameter of receptacula; glandular mounds crater-like (Fig. 20b)	*Ph. krausi* nov. sp.
9	Anterior parts of epigynal folds converging; atrium narrower than median plate (Fig. 21a, 22a)	10
–	Anterior parts of epigynal folds parallel or diverging (Fig. 17a, 18a, 25a)	11
10	Atrium deep, much narrower than median plate; copulatory ducts straight (Fig. 21)	*Ph. lividus*
–	Atrium nearly as wide as median plate; copulatory ducts C-shaped (Fig. 22)	*Ph. cespitum*
11	Sclerotised arch wedge-shaped; median plate quadrangular	*Ph. buxi*
–	Sclerotised arch slightly curved; median plate laterally convex (Fig. 17a, 18a, 25a)	12
12	Copulatory ducts strongly curved, not covered by receptacula in dorsal view (Fig. 25b)	*Ph. longipalpis*
–	Copulatory ducts rather straight, partially covered by receptacula in dorsal view (Fig. 17b, 18b)	13
13	Copulatory ducts approximately 2 times diameter of receptacula, glandular mounds distinct (Fig. 18b)	*Ph. fuscolimbatus*
–	Copulatory ducts approximately 1.5 times diameter of receptacula, glandular mounds indistinct (Fig. 17b)	*Ph. buchari*









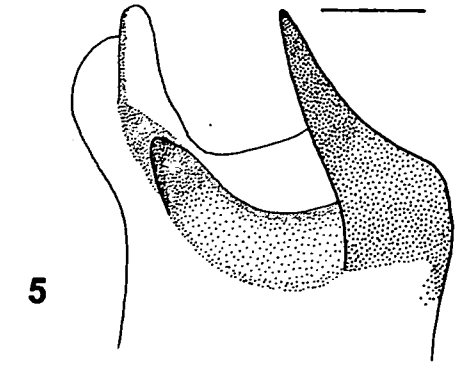


Fig. 1–2: Left male palp, ventral view. **1**: *Ph. aureolus* (Italy, Trieste, Aurisina). **2**: *Ph. bosmansi* nov. sp. (Algeria, Tissemsilt, Djebel Ouarsenis). **Abbreviations**: aSDL = ascending part of sperm duct loop; C = conductor; CyP = cymbial process; Cyt = cymbial tip; dSDL = descending part of sperm duct loop; E = embolus; EB = embolar base; IR = intertegular retinaculum; ITA = intermediate tibial apophysis; RTA = retrolateral tibial apophysis; rTP = retrolateral tegular projection; VTA = ventral tibial apophysis. Scale lines = 0.1 mm.

Fig. 3–5: Palpal tibia, retrolateral view. **3**: *Ph. krausi* nov. sp. (Turkey, Amasya, Turhal). **4**: *Ph. lunatus* nov. sp. (Greece, Corfu, Sgombou). **5**: *Ph. bosmansi* nov. sp. (Algeria, Tissemsilt, Djebel Ouarsenis). Scale lines = 0.1 mm.

Philodromus aureolus (Clerck 1757) (Fig. 1, 16, 26, 30)

Material examined: Italy. Trentino: Pergine Valsugana, San Cristoforo al Lago, 1♂, 14.6.1990, leg. Foddai. Trieste: Aurisina, 1♂, *Juniperus* beating, 6.5.1994, leg. Bertrandi. Puglia: Taranto, San Martina Franco S., Bosco Orimi, 1♂ 3♀♀, 9.6.2002, leg. Bosmans (CB). Sardinia: S Gennargentu, Foresta Montarbu, 1♂, 3.6.2003, leg Knoflach & Thaler. **Spain.** Andalusia: Matalascanas, 1♂, 8.4.1988, leg. Jocqué (CB). Soria: Burgo de Osma, 1♀, 25.5.1992, leg. Poot (CB).

Characterization: relatively large species (Fig. 26), CW 2.3–2.4, CYL 1.06–1.20 (2 specimens from northern Italy), femora III + IV distinctly spotted. ♂ **Palp** (Fig. 1): Tibial apophyses: VTA quadrangular, anterior border straight; ITA a low crest; RTA almost touching cymbial process (as in most species of the group except *Ph. buchari*, *Ph. collinus*). Cymbium broad, bulging prolaterally; cymbial process, a low crest. Tegulum (ventral view), nearly as long as broad, prolateral side rounded, anterior border rather transverse, slightly convex; retinaculum hidden by small retrolateral tegular projection. Loop of sperm duct directed retrolaterodistally, converging, ascending part diagonal. Conductor, at anterior wall of tegulum, comparatively narrow. Embolus, originating prolaterally, proximal to anterior edge of tegulum, falciform, smoothly curved, projection at embolar base moderate. ♀ **Epigyne/vulva** (Fig. 16): epigyne approximately 1.3 times as wide as long; median septum shaped like a conical flask; atrium not separated by a sclerotised arch. Copulatory ducts, comparatively long, rather straight, internal folds pointing inwards. Receptacula, bulbous, hardly half as long as copulatory ducts, standing close to each other and slightly anterior to epigastric furrow. Glandular mounds flat but well discernable.

Remarks: In central Europe this species is now well characterized (Segers 1987, 1990; Roberts 1993). However, in Europe more species exist in this group than previously assumed. In the past these have been confused with either *Ph. aureolus* or *Ph. cespitum* (see Segers 1992). Consequently we feel that literature records must be considered with care. For example, the specimens figured as *Ph. aureolus* from Israel by Levy (1977) are clearly different: VTA with oblique border, ITA well expressed, median septum of epigyne with distinct arch. The male palp cannot be definitely assigned to any species reported here, whereas the female genitalia clearly refer to *Ph. longipalpis*. As in the epigynes illustrated by Menge (1875, Tab. 228 K) and by Huber (1995, fig. 4B) a sclerotised arch is clearly visible, these observations must refer to other species as well.

Distribution: Palaearctic, temperate (?). To our surprise *Ph. aureolus* was rare in the collections studied from the true Mediterranean region, although the southernmost specimens came from Southern Italy and from Andalusia.

Philodromus bonneti Karol 1968

Identification: Karol (1968), female unknown.

Remarks: This species is not mentioned in Segers (1992), although palpal characters strongly support Karols inclusion in the *Ph. aureolus* group. It is known only from its locus typicus: Bursa, Turkey. In some respects it resembles *Ph. lunatus* nov. sp.: general configuration of tibial apophyses, long embolus originating at proximal half of cymbium. However, the embolus illustrated is irregularly curved, ITA pointed, but the drawings look rather schematic. The type could not been traced at MNHN (E.-A. Leguin, in litt.).

Philodromus bosmansi nov. sp. (Fig. 2, 5, 24, 26, 27)

Type material: Holotype ♂ (CB). **Algeria.** Tissemsilt: Theniet-el-Had, Djebel Ouarsenis, 1540 m, 17.6.1988, leg. Bosmans (MTD). Paratypes: **Algeria.** Tissemsilt: Theniet-el-Had, Djebel Ouarsenis, 1400 m, 2♂♂ 9♀♀, 1500 m, 2♂♂ 7♀♀, 1540 m, 1♂, 18.7.1988, leg. Bosmans. Depository of paratypes: CB, KBIN, MTD, MNHN. **Other Material examined: Algeria.** Bouira: Massif du Djurdjura, Tikjda, Tigounatine, 1460 m, 1♂, 1.6.1988, pitfalls leg. Bosmans (CB). Tizi Ouzou: Massif du Djurdjura, Ait Ouabane, 1410 m, 2♀♀, 13.6.1990, leg. Bosmans (CB).

Etymology: This species is named in honour of Dr. R. Bosmans, Gent, Belgium, who has laboured assiduously with Mediterranean spiders.

Diagnosis: Male palpal organs resemble *Ph. fuscolimbatus*, but can be distinguished

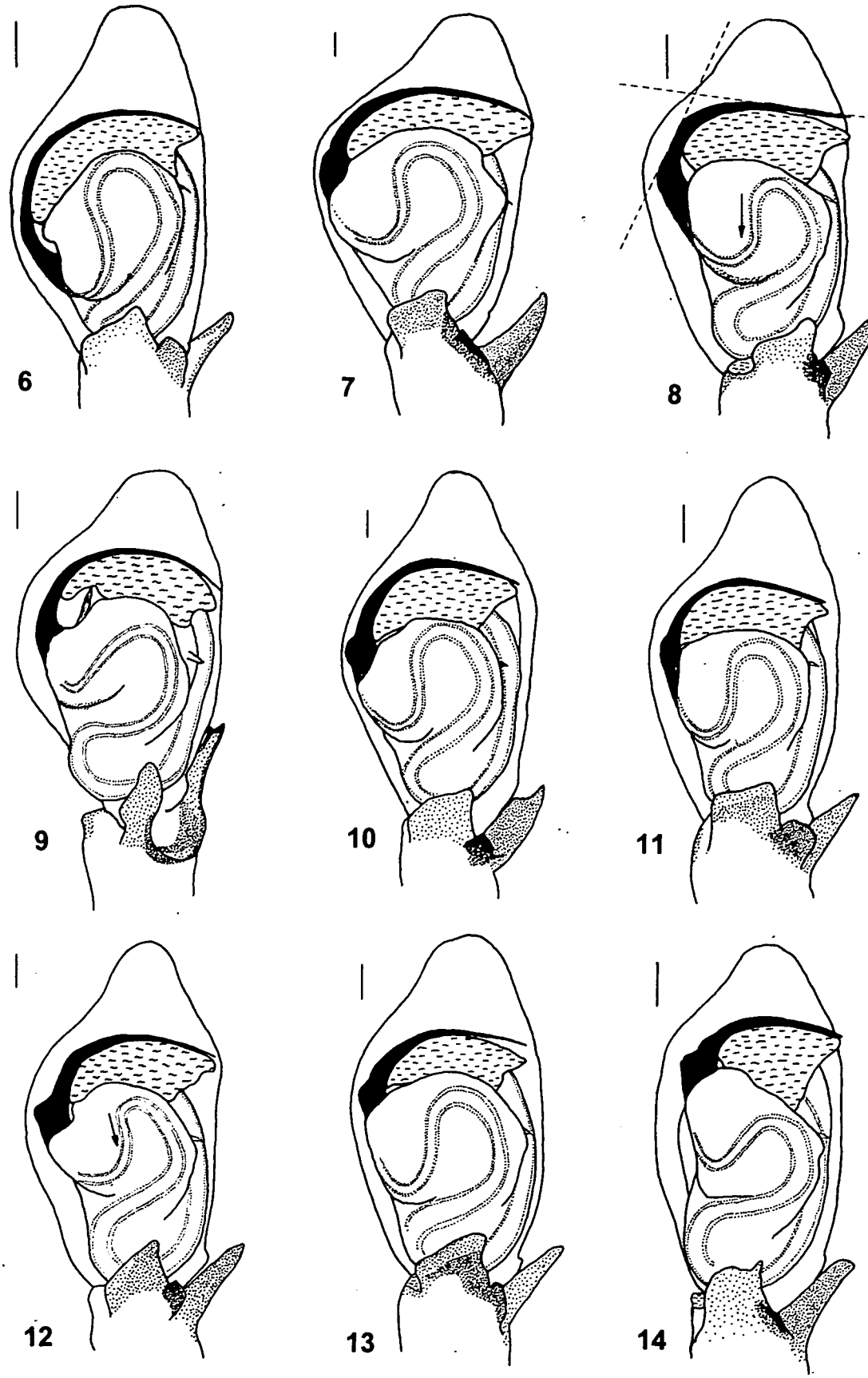


Fig. 6–14: Left male palp, ventral view. **6**: *Ph. lunatus* nov. sp. (Greece, Corfu, Sgombou). **7**: *Ph. buchari* (Turkey, Icel, Namrum). **8**: *Ph. praedatus* (Italy, Toscana, Grosseto). **9**: *Ph. collinus* (Greece, Kefalonia, Aenos). **10**: *Ph. longipalpis* (Italy, Calabria, Sibari). **11**: *Ph. krausi* nov. sp. (Turkey, Amasya, Turhal). **12**: *Ph. cespitum* (Italy, Southern Tyrol, Laimburg). **13**: *Ph. fuscolimbatus* (Italy, Trieste, Aurisina). **14**: *Ph. lividus* (Croatia, Dalmatia, Vodice). Scale lines = 0.1 mm.

by the unique shape of tibial apophyses, especially the long, pointed RTA (Fig. 5). Female genitalia are characterized by the lack of a sclerotised arch between the orifices. There is an overall similarity to the epigyne and vulva of *Ph. aureolus* and *Ph. praedatus*, but *Ph. bosmansi* nov. sp. differs in the presence of diagonal-vertical, sclerotised crinkles on the sides of the atrium (Fig. 24).

Description:

Dimensions: Species of intermediate size (Fig. 26). **Male** (n = 7): Total length 3.2–4.4, CL 1.6–1.95, CW 1.7–2.1. CYL 0.86–1.04, CYW 0.52–0.6. Leg I total length 8.6–11.1, femur I 2.3–2.8, tibia I 2.1–2.8. Femur IV 2.1–2.9, tibia IV 1.9–2.4. **Female** (n = 7): Total length 3.2–4.9, CL 1.4–1.75, CW 1.5–1.95. Epigyne, maximum width of median plate 0.28–0.34, atrium width 0.2–0.23. Leg I total length 5.5–7.6, femur I 1.4–2.0, tibia I 1.1–1.75. Femur IV 1.5–1.95, tibia IV 1.1–1.6. Compared with congeners of similar size, females are relatively short-legged.

Colour: Carapace, usually brown with broad beige median band and central whitish V-shaped sign. The carapace in males often uniformly coloured and in females sometimes more varied, with conspicuous dark patches behind lateral eyes, at posterior edges of carapace and behind V-sign. Sternum, pale yellowish. Legs, yellowish-brown without spots, femora III + IV conspicuously dark in distal half, especially in females, which usually have annulated tibiae and dark patellae on legs III + IV and some faint patches and stripes at the front legs as well. The abdomen is primarily whitish, but usually shows a highly contrasting pattern. In females, two colour variants have been observed: (a) the brownish-black darkening of the cardiac mark which extends to the posterior half of the abdomen, followed posteriorly by angular stripes, (b) the abdomen shows a pale whitish median band which carries the dark cardiac mark anteriorly and which is flanked by dark stripes in the posterior half. Both variants are laterally patterned with two to five dark patches, partially fused. In males the abdominal pattern is often covered by dense grey and metallic golden hairs.

♂ **Palp** (Fig. 2, 5): Tibial apophyses: anterior border of VTA slightly oblique, its retrolateral corner a triangular projection, retrolateral side of VTA bulged above the small, crestlike ITA, superficially imitating a "second ITA"; RTA, slender and pointed, its dorsal side clearly concave (Fig. 5). Cymbial tip, conspicuously short; cymbial process, a rounded lamina. Tegulum, without projections, its anterior border rather straight; retinaculum clearly visible from ventral view. Loop of sperm duct, directed retrolaterodistally, converging, ascending part diagonal, intermediate part almost reaching retrolateral border of tegulum. Embolus, short, falciform, smoothly curved, originating from prolateral-subdistal edge of tegulum; embolar base, slightly prominent.

♀ **Epigyne/vulva** (Fig. 24): epigyne 1.4 times as wide as long; atrium, narrower than maximum width of median septum; sclerotised arch missing, but atrium flanked by 2–4 diagonal ridges, which in ventral view of the epigyne are visible as S-shaped crinkles. Epigynal folds, S-shaped, slightly diverging anteriorly. Copulatory ducts, comparatively long, internal folds pointing inwards. Receptacula, bulbous, standing close to each other and to the epigastric furrow; copulatory ducts, roughly 2.5 times as long as receptacula. Glandular mounds, crestlike, at anterior side of receptacula.

Remarks: From northern Africa, some "*Philodromus*" species which have been described are valid but still poorly characterised. For various reasons, none of them seem to be identical to our specimens: *Ph. calidus* LUCAS 1846 differs in the pattern of colouration. According to the author it stands close to *Ph. tigrinus* (DE GEER 1778), which is currently considered to be a subspecies of *Ph. margaritatus* (CLERCK 1757) (see PLATNICK 2003). *Philodromus ornatus* LUCAS 1846 resembles *Thanatus* and was transferred to this genus by SIMON (1875). The figures of the male palp in the original description of *Ph. sitiens* FAGE 1929 clearly show that this species does not belong to the *Ph. aureolus* group. *Philodromus foucauldi* DENIS 1954 has been described from a single female from southern Algeria. Since the figure of the epigyne does not show sufficient details, we rely on the author's classification into the *Ph. rufus* group.

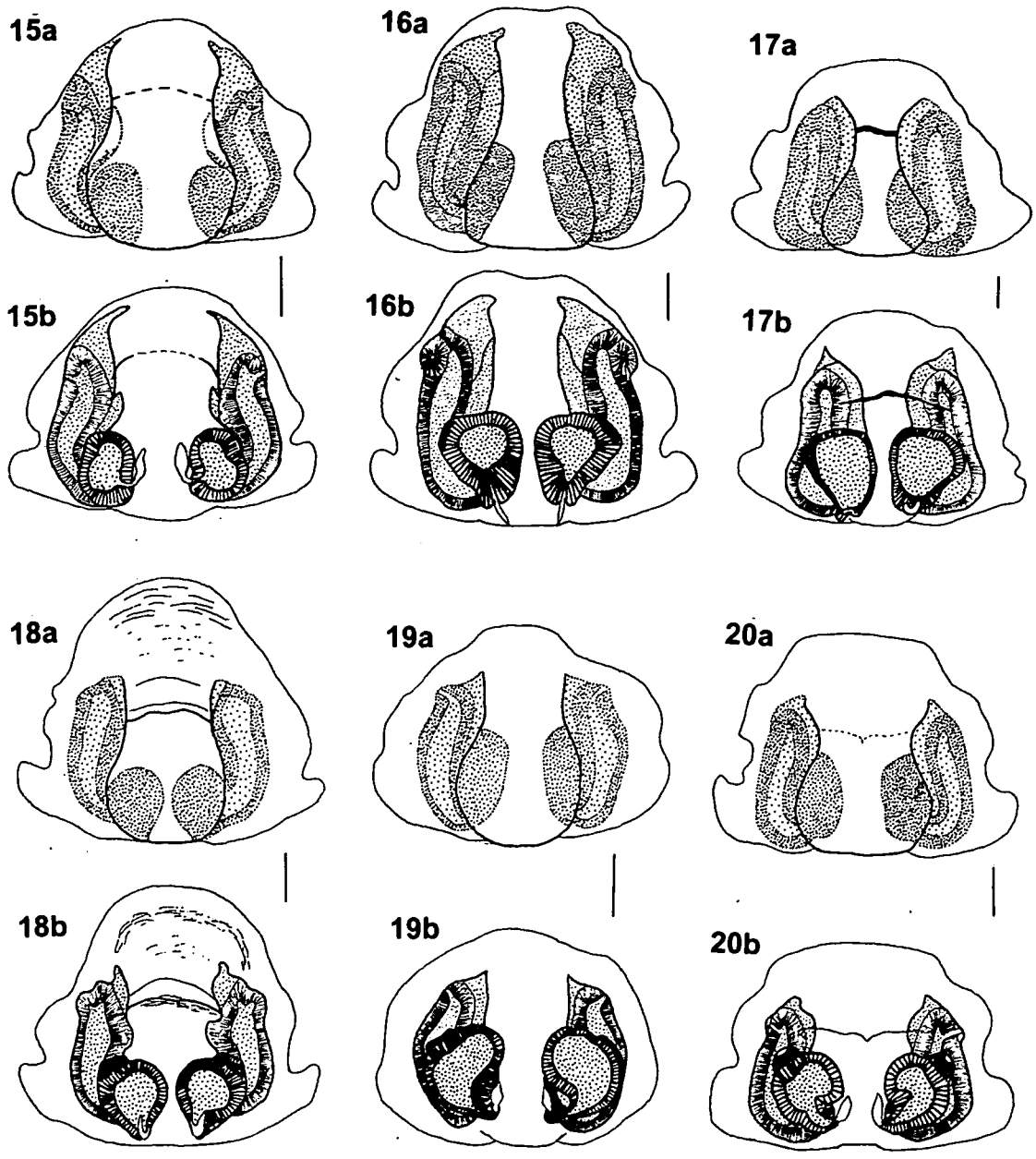


Fig. 15–20: a: Epigyne, ventral view; b: Vulva, dorsal view. 15: *Ph. praedatus* (Italy, Toscana, Grosseto). 16: *Ph. aureolus* (Germany, Saxony, Dresden). 17: *Ph. buchari* (Turkey, Icel, Namrum). 18: *Ph. fuscolimbatus* (Italy, Trieste, Aurisina). 19: *Ph. lunatus* nov. sp. (Greece, Corfu, Sgombou). 20: *Ph. krausi* nov. sp. (Turkey, Amasya, Turhal).

Distribution (Fig. 27): Up to now, only known from high elevations (> 1400 m) of the Tell Atlas in northern Algeria, where it has been found in mixed *Cedrus atlantica* and *Quercus fagina* forest. However, this altitudinal distribution might be an artefact of sampling bias at higher sites in this region (BOSMANS, in litt.).

Philodromus buchari KUBCOVÁ 2004 (Fig. 7, 17, 26)

Material examined: France. Vaucluse: Rousillon, 1♂, 16.5.1989, leg. POOT (CB). **Turkey.** Prov. Icel: Namrum, 1100–1500 m, 1♂ 1♀, 8–10.6.1983, leg. ASPÖCK & RAUSCH.

Comparative material: Czech Republic. Bohemia: Karlštejn, 1♂, 13.6.2001, 1♀ 17.6.2002, leg. KUBCOVÁ (CK). **Germany.** Saxony: Halbendorf (Oberlausitz), 1♀, 12.7.1955, ex. Coll. H. HÖREGOTT (MTD).

Description: see KUBCOVÁ, this volume. The usage of this name in our publication is herewith disclaimed for nomenclatural purposes, see ICZN Article 8.3.

Remarks: In our opinion this species stands close to *Ph. aureolus* and *Ph. longipalpis*, with both of which it has been confused in the past. The best discriminating characters, from *Ph. aureolus*, are the retrolaterally pointing RTA (Fig. 7) and the presence of a sclerotised arch in the epigyne (Fig.

17a). In contrast to *Ph. longipalpis*, the cymbium is strongly bulged and the RTA is not "broken" dorsally. While KUBCOVÁ (this volume) mentions difficulties distinguishing females of *Ph. buchari* from *Ph. longipalpis*, we feel that an unequivocal separation is feasible. In *Ph. longipalpis*, the copulatory ducts are C-shaped (as opposed to almost straight in *Ph. buchari*), their lumen is much wider, the sclerotised arch is more strongly developed and the receptacula do not cover parts of the copulatory duct in dorsal view, as they do in *Ph. buchari*. The simultaneous examination of females of both species allows us to assign the epigynes figured by ROBERTS (1993) to *Ph. buchari*. We think that other records of *Ph. longipalpis* from mid-Europe (e.g. HARVEY et al. 2002; JÄGER & KREUELS 1995; KOOMEN & PRINSEN 1997; BRAASCH 1998; SCHIKORA & SACHER 1998), presumably also refer to this species, as well as the male figured by BÖSENBERG (1902: fig. 491) as *Ph. micans* from a pine forest near Ems. This assumption is corroborated furthermore by the detection of *Ph. buchari* in material at MTD from Saxony (see comparative material). The specimens from Turkey differ in some details from central-European material, e.g. the male bears conspicuous chemosensitive hairs at the tip of the cymbium and the epigynal folds are more strongly divergent anteriorly. However, we consider such differences to fall within the range of variability of a single biological species.

Distribution: Europe, Asia Minor.

Philodromus buxi SIMON 1884

Identification: BRAUN (1965), ROBERTS (1985, 1998).

Material examined: **Spain**. Avila: Monbeltran, 1♂ 1 ♀ (subad), 10.5.1992, leg. POOT (CB). Sevilla: Aznalcazar, 1♂, 6.4.1988, leg. R. JOCQUÉ (CB). Soria: El Burgo de Osma, 1♂, 26.5.1992, leg. POOT (CB).

Remarks: Both sexes of *Ph. buxi* have highly characteristic genitalia. In males, the tegulum bears a distinctive projection at the retrolateral side ("durchsichtiges Chitinspitzchen", BRAUN 1965); together with the exceptionally long retinaculum it gives the impression of an open beak ("geöffneter Vogelschnabel", BRAUN 1965). Females of *Ph. buxi* can easily be separated from all congeners by the wedge-shaped sclerotised arch combined with the almost parallel margins of the median plate.

Distribution: Europe to Kazakhstan (PLATNICK 2003). There are records as far east as Sakhalin (MARUSIK et al. 1993). Surprisingly, our material contained a few specimens of *Ph. buxi* from Spain only, although this species is currently listed in checklists from all Mediterranean peninsulas. In central Europe, *Ph. buxi* seems to be thermophilous, its range barely exceeding the Hercynian mountains to the north (the species has been removed from the checklist of British spiders by MERRETT & MURPHY 2000). Noteworthy is the "gap" in the thoroughly explored countries Austria (BLICK et al. 2002), Czech Republik (BUCHAR & RUZICKA 2002), Slovakia (GAJDOS et al. 1999) and Poland (PROSZYNSKI & STAREGA 1997).

Philodromus cespitum (WALCKENAER 1802) (Fig. 12, 22, 26, 32, 33)

Material examined: **Italy**. Southern Tyrol: Vadena, Laimburg, 2♂♂ 4 ♀♀, 12.6.1997, leg. LÖSCH. Trentino: Pergine Valsugana, San Cristoforo al Lago, 1♂, 30.6.1990, leg. FODDAI. **Macedonia**. Doiran Lake, 1♂, ex Coll. ROEWER (SMF 30411/1). **Greece**. Makedonia: Florina, N lake Mikri Prespa, 800 m, 3♂♂ 1 ♀, 12.6.1997, leg. BOSMANS (CB). Lakonia: Mavrovouni, 1 ♀, 26.5.1998, leg. BOSMANS (CB). Thessaloniki: Epanoumi, 10 m, 1 ♀, 13.6.1997, leg. BOSMANS (CB). Crete: Aptera, 1 ♀, May.1926, leg. ROEWER (SMF Coll. ROEWER 1699).

Characterization: species of intermediate dimensions (Fig. 26), showing little size variation (compare DONDALE 1961), CW 2.0–2.1, CYL 0.98–1.05 (n = 4), legs with or without faint spots. ♂ **Palp** (Fig. 22): Tibial apophyses: VTA, trapezoid to triangular, its anterior border diagonal; ITA, connected with VTA by distinct sclerotized ridges, cap-shaped, projecting at almost right angles, not bifid in all specimens (contra SEGERS 1992); RTA, tapering, usually with oblique tip. Cymbium, moderately bulging prolaterally, cymbial process, hardly projecting. Tegulum, with projection retrolateral-distal to origin of embolus, its retrolateral-distal border oblique. Retinaculum visible from ventral view. Loop of sperm duct, conspicuously asymmetric, compressed from retrolateral-distal side, descending part pointing to retro-

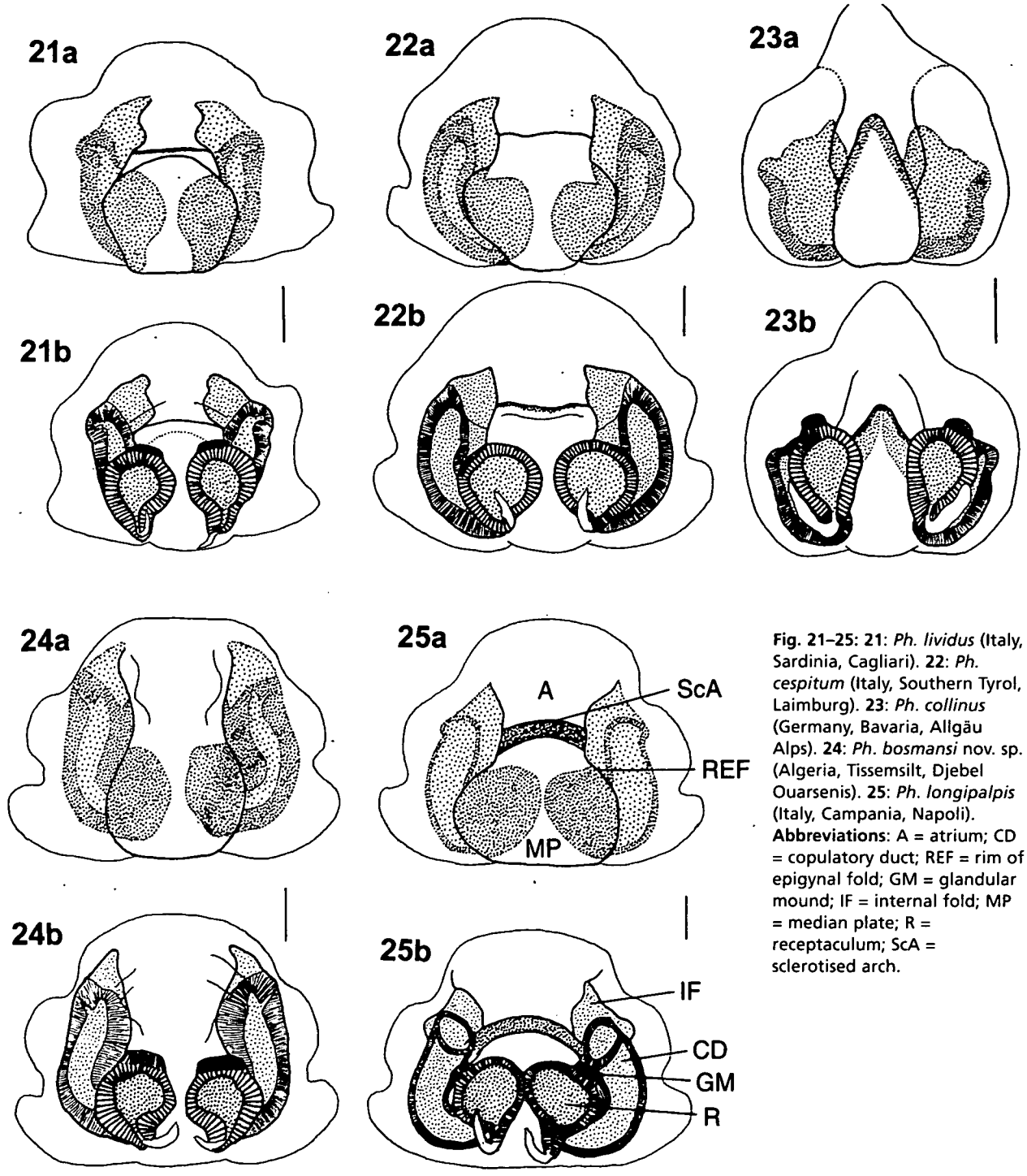


Fig. 21–25: 21: *Ph. lividus* (Italy, Sardinia, Cagliari). **22**: *Ph. cespitum* (Italy, Southern Tyrol, Laimburg). **23**: *Ph. collinus* (Germany, Bavaria, Allgäu Alps). **24**: *Ph. bosmansi* nov. sp. (Algeria, Tissemsilt, Djebel Ouarsenis). **25**: *Ph. longipalpis* (Italy, Campania, Napoli). **Abbreviations**: A = atrium; CD = copulatory duct; REF = rim of epigynal fold; GM = glandular mound; IF = internal fold; MP = median plate; R = receptaculum; ScA = sclerotised arch.

lateral corner of cymbium (this is even more pronounced in specimens from mid-Europe, see ROBERTS 1985: fig. 43e). Embolus, of intermediate length, originating subdistally, irregularly curved, basal part diagonal, distal part almost transverse. Embolar base, large and striking. ♀ **Epigyne/vulva** (Fig. 22a, b): Epigyne 1.25–1.40 times as wide as long; median plate, nearly as wide as long; atrium, narrower than median plate; sclerotised arch, strongly developed; epigynal folds, bulging in posterior half, anteriorly parallel. Receptacula, globular, half as long as the copulatory ducts, separated by less than 1/3 of their diameter, close to epigastric furrow; glandular mounds, inconspicuous.

Distribution: *Philodromus cespitum* is the only holarctic species in the *Ph. aureolus*-group (DONDALE 1961). Being one of the

most frequent *Philodromus*-species in central Europe, *Ph. cespitum* reaches higher latitudes and altitudes than all its congeners (PALMGREN 1983). *Ph. cespitum* seems to be rare in the Mediterranean region. Most of the numerous old records certainly refer to misidentifications when compared with recently described or reinstalled species of this group. The presence of this species on Crete should be corroborated bearing in mind the problems of other ROEWER records from this island (HELVERSEN & MARTENS 1972).

Philodromus collinus C. L. KOCH 1835 (Fig. 9, 23, 26, 31)

Ph. collinus istricus BRAUN 1965, Senckenbergiana biologica 46: 410–411, Abb. 91a–b. New synonym.

Material examined: **Spain**. Gerona: Puerta de Tosas, 1800 m, 1♂, 10.7.1991, leg. BOSMANS (CB). Parc national de Ordesa, 1300 m, 1♂, 31.7.1984, leg. BOSMANS (CB). **Croatia**. Istria, Rovinj, 1 ♀, May 1960, leg. STREBLE (SMF 15383, Holotype of *Ph. collinus istricus*). **Greece**. Kefalonia, Aenos, 1048 m, 1♂ 3 subad., 16.5.2002; 1540 m, 1♂, 14.5.2002, leg. KNOFLACH & THALER.

Characterization: rather small species (Fig. 26), CW 1.8–1.9; CYL 0.82–0.92 (n = 2). Legs, without spots but occasionally with brown rings, distal half of femora III and IV usually darkened. ♂ **Palp** (Fig. 9): Tibial apophyses: VTA, narrowed at its base, "cobrahead-shaped" (BRAUN 1965); ITA, not developed; RTA, long and thin, stalk-like, sometimes with bifid tip. Cymbium, bulging prolaterally; cymbial process, a crestlike lamina, barely projecting. Tegulum, trapezoid, its anterior border variable from oblique to round; retinaculum, clearly visible from ventral view. Loop of sperm duct, transverse, its opening wide, pointing to prolateral side. Embolus, of intermediate length, originating subdistally, smoothly curved, rapidly tapering to a filament in its distal half. Embolar base, smooth. Prolateral side of conductor, not close to embolar base, leaving a "window". ♀ **Epigyne/vulva** (Figs. 23a, b): epigyne, nearly as wide as long; epigynal field, anteriorly triangular; median plate, wedge-shaped, its pointed tip dividing the atrium. Copulatory ducts, short, running almost diagonally. Receptacula, onion-shaped, as long as copulatory ducts and projecting further anteriorly, separated by at least half of their diameter from each other, standing anterior to epigastric furrow. Glandular mounds, conspicuous.

Remarks: *Philodromus collinus* is clearly distinguishable from all west-Palaearctic congeners by its unique tibial apophyses and by its epigyne. In contrast to the opinion of BRAUN (1965), colouration is highly variable. Specimens with unicoloured legs and without dorsal pattern at opisthosoma occur both in the Mediterranean region and in central Europe. Consequently, in our view establishment of the subspecies *Ph. c. istricus* is not justified. Variation is considerable, even in the male palp: in most specimens from the Alps and Saxony, the RTA is pointing to a single tip, whereas it is bifid in Greek and, obviously, in some British specimens (see ROBERTS 1985: Fig. 44b). Specimens from Greece differ from all extra-Mediterranean ones in the following characters: the anterior border of tegulum is rounded (not straight to oblique as figured in BRAUN 1965, ROBERTS 1985), the retinaculum is completely visible from ventral view. However, we regard these differences as falling well within the range of variation of a single biological species.

Distribution: Europe, in the Mediterranean it is possibly restricted to higher altitudes.

Philodromus fuscolimbatus LUCAS 1846 (Fig. 13, 18, 26)

Ph. aureolus rufolimbatus KULCZYNSKI 1891, in: CHYZER & KULCZYNSKI (1891: 111, pl. 4, f. 23). New synonym.

Material examined: **Algeria**. Blida: Meurdja, 900 m, 2♂♂ 2♀♀, 30.5.1987; 1000 m, 4♀♀, 17.7.1988, leg. BOSMANS (CB). Bouira: Massif du Djurdjura, Tala Rana, 1310 m, 1♂ 3♀♀, 1.6.1988; Tikjda, 1460 m, 3♂♂ 3♀♀, 1.6.1988, leg. BOSMANS (CB). Tissemsilt: Theniet-el-Had, Djebel Ouarsenis, 1400 m, 4♂♂ 2♀♀, 1500 m, 1♂ 1 ♀, 18.7.1988; 1540 m, 1♂, 17.6.1988, leg. BOSMANS (CB). **Spain**. Cadiz: Tarifa, 1 ♀, 15.5.1991, 5♂♂ 2♀♀, April 1992, leg. POOT (CB). Gerona: Brugera, Col de Jou, 1600 m, 1♂, 8.7.1991, leg. BOSMANS (CB). Huesca: Ainsa, 1♂ (subadult) 1 ♀, 16.5.1987, leg. POOT (CB). **France**. Ardèche: Coux, 3♂♂, 7.6.1987, leg. POOT (CB). **Italy**. Trentino: Riva del Garda, Monte Rocchetta, 3♂♂ 6♀♀, 30.5.1963, leg. THALER. Trieste: Aurisina, 2♂♂ 1 ♀, foliage beating, 6.5.1994, leg. BERTRANDI. **Croatia**. Krk, Baska, 2♂♂ from *Pinus*, 21.5.1988, leg. KREISSL.

Molise: Bojano, 2 ♀♀, 7.6.2002, leg. BOSMANS (CB). Greece. Korinthia: N Evrostino, 1 ♀, 7.8.2001, leg. BOSMANS (CB). **Turkey**. Bilecik (near Eskisehir), 2♂♂, 14.6.1967, leg. KNAPP.

Characterization: large species, size variation considerable (Fig. 26): CW 2.0–3.0; CYL 0.96–1.37 (n = 9♂♂); legs without spots. ♂ **Palp** (Fig. 13): Tibial apophyses: VTA, trapeziform, its anterior border oblique; ITA, a small lateral projection of VTA; RTA, with relatively broad base, its borders more or less straight from all views. Cymbium, narrow, weakly bulging, cymbial process moderately protruding as a transparent, rounded lamella. Tegulum, suboval, tapering posteriorly; retrolateral and prolaterodistal processes, subtle; tip of retinaculum visible from ventral view. Loop of spermduct, descending part directed towards the prolateralobasal corner of cymbium. Embolus, short, originating from prolateral-subdistal edge of tegulum, slightly curved, its distal half rather straight; embolar base, little thickened. Conductor small. ♀ **Epigyne/vulva** (Fig. 18): epigyne, comparatively narrow (1.1 times as wide as long) due to the large extension of the epigynal field anterior to the epigynal folds; atrium, as wide or slightly narrower than median plate; sclerotised arch, strongly developed; epigynal folds, parallel to divergent in anterior half. Receptacula, globular, with marked glandular mounds, standing close to each other and near the epigastric furrow. Epigynal folds approximately 2.2 times diameter of receptacula.

Remarks: Our material differs in some characters from the redescription by SEGERS (1992): there is no pointed process midway on the retrolateral margin of tegulum and the receptacula are not separated by about their diameter. In addition, some of our specimens clearly exceed the range of measurements given by SEGERS (1992), in particular males from Croatia and Turkey. But SEGERS (1992) already noted that *Ph. fuscolimbatus* exhibits the greatest variability in both body size and shape of the palpal organs of all of these species. He also emphasized its sometimes problematic delimitation from *Ph. cespitum* and speculated that *Ph. fuscolimbatus* might turn out to be a subspecies of the former. However, males of these species are easily distinguished by the shape of VTA. An additional discriminating character, not mentioned by SEGERS (1992), is the form of the loop of the sperm duct. Its descending part points towards the retrolaterobasal corner of cymbium in *Ph. cespitum*, but prolaterobasally in *Ph. fuscolimbatus*. *Philodromus a. rufolimbatus*, which was not mentioned by SEGERS (1992), is placed herewith in synonymy of *Ph. fuscolimbatus*. The configuration of the tibial apophyses as drawn by KULCZYNSKI for his subspecies, suggests this conclusion, as also its terra typica (Hungary, Croatia, Dalmatia).

Distribution: Apparently Holomediterranean, northwards to the Alps in Southern Tyrol and Trentino. In this region we found sympatry with *Ph. cespitum*, which provides an additional argument against subspecific status.

Philodromus krausi nov. sp. (Fig. 3, 11, 20, 26, 27)

Type material: Holotype ♂, **Turkey**. Prov. Amasya: Turhal, 500 m, *Pinus/Quercus* beating, 4.6.1967, leg. W. KNAPP (LI). Paratypes: 1 ♀ (LI), 1 ♀ (NMW), together with holotype.

Other Material examined: **Turkey**. Prov. Kütahya: western slopes of Budagan Dag, 1000 m, 1 ♀, 22.5.1985, leg. RAUSCH (NMW).

Etymology: This species is named in honour of Prof. Dr. O. KRAUS, University of Hamburg, Germany.

Diagnosis: Males of *Ph. krausi* can be distinguished from all Mediterranean congeners by the exceptional large ITA (Fig. 11). Within the group of species with intermediate embolus length, it stands close to *Ph. longipalpis* and *Ph. fuscolimbatus*. From the former it differs in the conspicuous cymbial process, which is flat in *Ph. longipalpis*. In comparison with *Ph. fuscolimbatus*, shape and relative size of VTA and ITA are the best discriminating characters. Females are easily distinguished by the broad median plate and the wide atrium of the epigyne.

Description:

Dimensions: Species of intermediate size (Fig. 26). **Male** (n = 2): Total length 4.25, 4.50; CL 2.1, 2.1; CW 2.0, 2.15. CYL 0.90, 0.95; CYW 0.49, 0.51. Leg I total length 10.2, 10.8; femur I 2.6, 2.7; tibia I 2.6, 3.4. Femur IV 2.4, 2.6; tibia IV 1.75, 1.9. **Female** (n = 2): Total length 5.4, 6.0; CL 2.0, 2.35; CW 1.85, 2.25. Epigyne, maximum width of

median plate 0.23, atrium width 0.21. Leg I total length 7.1, 10.0; femur I 2.1, 2.7; tibia I 1.6, 2.4. Femur IV 1.8, 2.4; tibia IV 1.4, 2.0.

Colour: **Male**: Carapace orange-brown with bright V-shaped sign behind the eyes. Sternum, pale yellow-brown. Legs, uniformly orange-brown. Abdomen, light grey, covered with metallic gold hairs; cardiac mark, inconspicuous. **Female**: Carapace, with broad yellowish median band, sides brown. Colour of sternum and legs, pale yellowish brown. Distal half of femora and distal leg segments with dark brown spots and stripes. Abdomen, dorsally whitish, with yellow and brown dots, in its posterior half with a large grey patch, its sides also with dark grey flecks.

♂ **Palp** (Fig. 3, 11): Tibial apophyses: VTA, quadrangular, its anterior border straight; ITA, a large diagonally prominent lamina; RTA, fin-shaped, its dorsal margin convex, its ventral margin straight (Fig. 3). Cymbium, slightly bulging prolaterally, its tip rather narrow; cymbial process, a conspicuous tip. Tegulum, trapezoid with rounded edges, tapering posteriorly, without projections; retinaculum, visible from ventral view. Loop of sperm duct, diagonal, its descending part pointing towards the prolateralobasal corner of cymbium. Embolus, of intermediate length, originating from prolateral-distal edge of tegulum, sickle-shaped. Embolar base, slightly thickened. ♀♀ **Epigyne/vulva** (Fig. 20): epigyne 1.25 times as wide as long; atrium, as wide as median plate; sclerotised arch, weakly developed; epigynal folds, S-shaped; copulatory ducts, C-shaped, twice as long as receptacula. Receptacula, globular, separated 0.5–0.7 times their diameter from each other and from the epigastric furrow. Glandular mounds, crater-like.

Distribution (Fig. 27): Known from two distantly separated localities in central Anatolia only, which suggests a wide distribution at moderate elevations in Asia Minor.

Philodromus lividus Simon 1875 (Fig. 14, 21, 26, 27, 29)

Material examined: **Algeria**. Skikda: Collo, Tamanart, 0–30 m, 1♂ 1♀, 20.6.1985, leg. Bosmans (CB). **France**. Côte d'Azur: Estérel, 1♀, 26.5.1988, leg. Van Uyten (CB). **Italy**. Basilicata: Trivigno, 1♂, 11.6.2001, leg. Bosmans (CB). Puglia: Taranto, S San Martina

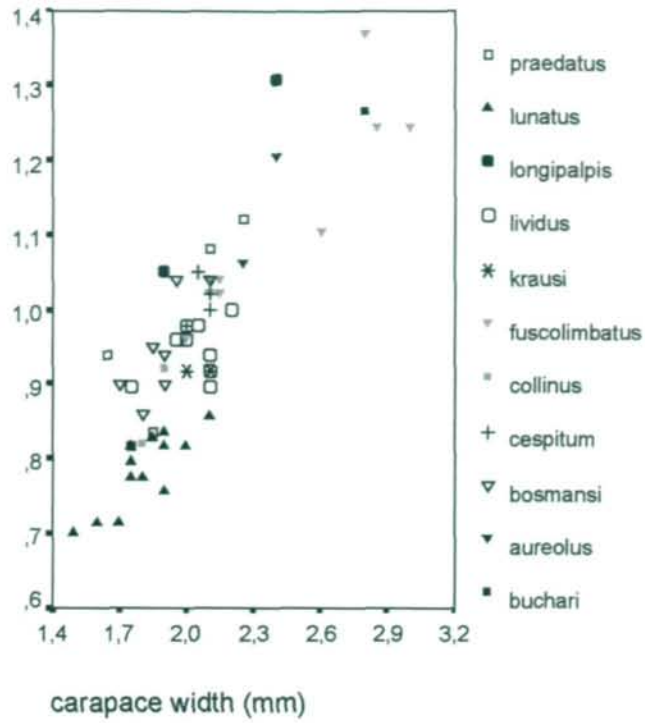


Fig. 26: Scatter diagram, showing size differences between 11 *Philodromus* species occurring in the Mediterranean region.

Franco, 6♂♂ 3♀♀, 9.6.2002, leg. Bosmans (CB). Calabria: Sibari beach, 4♂♂, 31.5.–17.6.1977, leg. Meyer. Sardinia: Cagliari, 4♂♂ 4♀♀, May-June 2001, leg. Grill. Ogliastra, 718 m, 1♂, 2.6.2003, leg. Knoflach & Thaler. Lanusei, Bosco Selene, 930 m, 1♂, 6.6.2003, leg. Knoflach & Thaler. Baunei, Golgo Plateau, 400–580 m, 9♂♂ 5♀♀, 7.6.2003, leg. Knoflach & Thaler. Baunei, 1♂, May 1981, leg. Wunderlich (CB). **Croatia**. Dalmatia, Vodice WNW Sibenik, 1♂, 14.6.1983, leg. Kreissl.

Characterization: Species of intermediate size (Fig. 26), CW 1.8–2.2, CYL

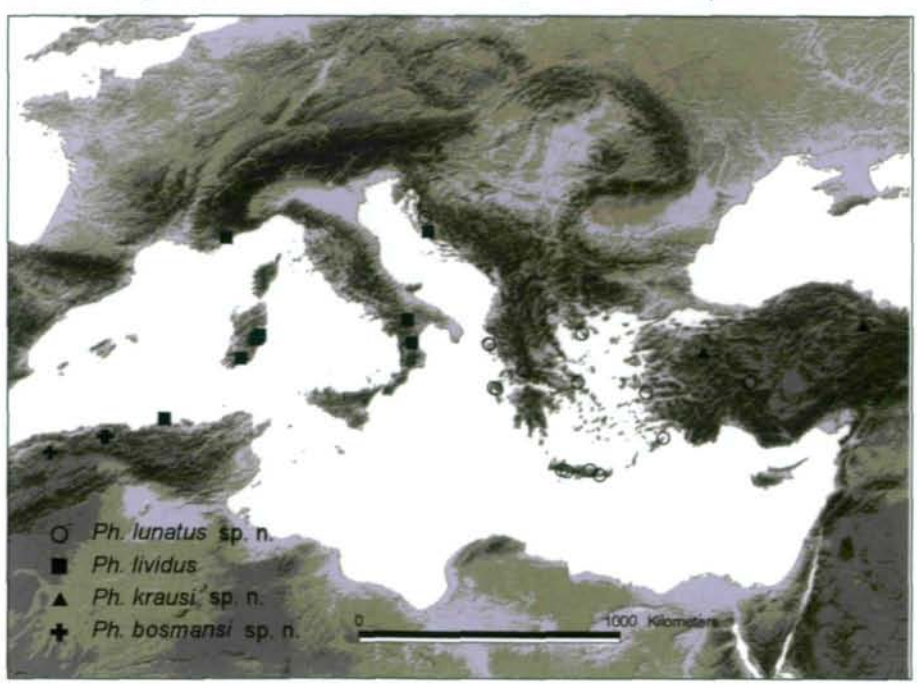


Fig. 27: Distribution areas of some *Philodromus* species restricted to the Mediterranean region: *Ph. bosmansi* nov. sp., *Ph. krausi* nov. sp., *Ph. lividus* Simon 1875, *Ph. lunatus* nov. sp.

0.90–1.00 (n = 9). Legs, with distinct spots, spots usually also on carapace and sternum. ♂ **Palp** (Fig. 14): Tibial apophyses: retrolateral corner of VTA pointed; ITA, inconspicuous; RTA, truncate. Cymbium, narrow; cymbial process, crestlike. Tegulum (ventral view), longer than broad, prolateral side straight, anterior border oblique; retinaculum, visible. Loop of sperm duct, widely open, ascending part nearly rectangular, running transversely to longitudinal axis of tegulum. Conductor, almost triangular. Embolus, originating at anterior edge of tegulum, falciform, distinctly more curved in its proximal part, its base projecting, angular. ♀ **Epigyne/vulva**: epigyne, 1.25 times as wide as long; atrium, deep, clearly narrower than median plate; median plate, approximately as wide as long; sclerotised arch, present. Copulatory ducts, comparatively short, internal folds strongly curved inwards. Receptacula, globular, relatively large, their diameter half as long as epigynal folds, standing close to each other and to the epigastric furrow; glandular mounds, inconspicuous.

Remarks: Until recently *Ph. lividus* has been given at most subspecific status. According to the characters presented above (and in SEGERS 1992), it can be readily separated from its congeners.

Distribution (Fig. 27): According to SEGERS (1992) *Ph. lividus* is a West Mediterranean species, occurring from Portugal to southern France, in Corsica and in N. Africa, Algeria and Morocco. Our records extend the range eastwards to the Central Mediterranean, Sardinia, Calabria and Dalmatia. Apparently, it does not reach the Balkan peninsula. *Ph. lividus* is restricted to the true Mediterranean region. It is often found near the coast and does not reach the southern slopes of the Alps.

Philodromus longipalpis SIMON 1870 (Fig. 10, 25, 26)

Material examined: **France**. Haute Corse: Castirla, 1 ♀, 23.5.1995, leg. BOSMANS (CB). **Italy**. Molise: Bojano, 1♂, 7.6.2002, leg. BOSMANS (CB). Campania: Napoli, Vesuvius E slope, 1 ♀, 12.6.2002, leg. BOSMANS (CB). Basilicata: Trivigno, 1♂ 3 ♀♀, 11.6.2001, leg. BOSMANS (CB). Calabria: Sibari beach, 1♂, 12.6.1977, leg. S. MEYER. **Greece**. Atiki-Piraeus: Alepohori, 1 ♀, 22.5.1998, leg. Bosmans (CB). Arkadia: Oros Likeo, N Ano Karies, 1 ♀, 29.5.1998, leg. BOSMANS (CB). Chania: Daratos, 25 m, 1 ♀, 8 July, 2003, leg. BOSMANS (CB). **Bulgaria**. Sofia city, Hotel Enny, 550 m, 1♂, 5.7.2003, leg. MUSTER (CM). **Turkey**. Balikesir: Karamürsel, 1 ♀, 3.8.1988, leg. MERTENS (CB). Günlüce, 1 ♀, 4.8.1988, leg. MERTENS (CB). **Iran**. Prov. Golestan: Tangegol, Golestan national park E Gonbad-e Quabus, 800 m, 1♂ 1 subad. ♀, 22.–24.5.2001, leg. HEISS.

Characterization: Species of intermediate size (Fig. 26), CW 1.9–2.4, CYL 1.05–1.3 (n = 2). Comparatively long-legged, legs with spots on all segments, opisthosoma with curved grey lines laterally (if always?). ♂ **Palp** (Fig. 10): Tibial apophyses: VTA, trapeziform, its anterior border oblique; ITA, relatively large, almost quadrangular; RTA, slightly curved in ventral view, its dorsal margin with distinct step („broken" according to SEGERS 1992: 20), outer surface rugose. Cymbium, narrow, exceptionally long compared to total size (Fig. 26); cymbial process, almost flat, subdistally with inconspicuous lamina. Tegulum, suboval, tapering posteriorly, without remarkable projections; retinaculum, visible from ventral view. Loop of sperm duct, wide, its descending part almost parallel to longitudinal axis of cymbium. Embolus, sickle-shaped, smoothly curved, originating subdistally. Embolar base, prominent. ♀ **Epigyne/vulva** (Fig. 25): epigyne 1.3–1.4 times as wide as long; atrium, narrower than median plate; sclerotised arch, exceptionally well developed. Epigynal folds, bulging in posterior half, parallel on the level of the sclerotised arch, diverging anteriorly. Copulatory ducts, C-shaped, with remarkable wide lumen and thin walls, internal folds pointing outwards. Receptacula, slightly ovoid, almost touching each other, standing anterior to epigastric furrow, not covering copulatory ducts in dorsal view. Glandular mounds, hemispherical elevations on lateral-distal position of the receptacula. Epigynal folds, approximately twice length of receptacula.

Remarks: see *Ph. buchari*.

Distribution: Holomediterranean from Spain to Turkey. Furthermore, our record from Iran extends its range to the Near East.

Philodromus lunatus nov. sp. (Fig. 4, 6, 19, 26, 27)

Type material: Holotype: ♂, Greece. Corfu: Spartilas 350 m, 29.5.1996, leg. KNOFLACH & THALER (LI). Paratypes: 7♂♂ 4♀♀ together with holotype. Spartilas 650 m, 3♂♂ 2♀♀, 31.5.1996, leg. KNOFLACH & THALER. Spartilas 600 m, 2♂♂ 1♀, 4.6.1997, leg. HEISS. Sgombou 100 m, 4♂♂, 6♀♀, Phrygana beating, 28.5.1996, leg. KNOFLACH & THALER. Depository of paratypes: LI, MHNG, MTD, NMW, SMF, CM, CTh.

Other Material examined: Croatia. Dalmatia: Starigrad-Paklenica, 1♂, 24.9.1983, leg. KREISSL. **Greece**. Atiki-Piraeus: Alepohori, 4♂♂ 3♀♀, 22.5.1998, leg. BOSMANS (CB). Chalkidiki: Sithonia Peninsula, Nikiti, 1♂, 28.4.2000, leg. KNOFLACH & THALER. Crete: Chania, Imbros, 900 m, 1♀, 7.7.2003, leg. BOSMANS (CB). Rethimno, Preveli palm beach, 1♀, 5.7.2003, Plakias, 5 m, 1♀, 6.7.2003, leg. BOSMANS (CB). Evia: S Velos, Prasino, 2♀♀, 14.5.2001, leg. BOSMANS (CB). Kefalonia: S Argostolion, 1♂, 18.4.1971, leg. SCHEDL. Karavados, 1♂ 2♀♀, 12.5.2002, leg. KNOFLACH & THALER. Kriti: Irakleio, Potamies, MoniGouverniotissas, 250 m, 3♂♂ 2♀♀, 9.5.2003, leg. BOSMANS (CB). Lasithi, Koutsras, 50 m, 1♂, 13.5.2003, leg. BOSMANS (CB). Rhodos: W Apollonia, 1♀, 20.5.1996, leg. BOSMANS (CB). **Turkey**. Prov. Izmir, Özdere 25 m, 1♂, 19.5.1996. leg. SCHEDL. Prov. Konya, Aksehir 1100 m, 1♂, 10.6.1967, leg. KNAPP, 1♂ 11.6.1967, leg. ASPÖCK. [**France**: Alpes Maritimes, 1♂ ex. Coll. ROEWER RII/12822 (SMF 30411/1)].

Etymology: The species is named after its crescent-shaped embolus (Latin "lunatus" = bent into a crescent).

Diagnosis: Males of *Ph. lunatus* can be distinguished from all related species by the exceptionally long embolus which originates in the posterior half of the tegulum (Fig. 6). Females can be recognized by the combination of two characters: absence of a sclerotised arch and large receptacula which cover more than half of the copulatory ducts (Fig. 19).

Description:

Dimensions: Smallest species of the group (Fig. 26). **Male** (n = 5): Total length 3.2–3.9, CL (n = 15) 1.5–2.0, CW (n = 15) 1.5–2.1. CYL (n = 15) 0.70–0.86, CYW 0.4–0.44. Leg I total length 7.6–10.0, femur I 2.0–2.5, tibia I 2.15–2.6. Femur IV 1.75–2.3, tibia IV 1.45–2.0. **Female** (n = 5): Total length 3.9–5.4, CL 1.65–2.0, CW 1.65–2.1. Epigyne, maximum width of median plate 0.20–0.24, atrium width 0.15–0.18. Leg I total length 7.3–10.5, femur I 1.9–2.8, tibia I 1.6–2.5. Femur IV 1.7–2.15, tibia IV 1.3–1.65.

Colour: Carapace, yellowish- to orange-brown, usually with bright V-shaped sign behind the eyes, in females with a pronounced whitish median band and darker lateral parts. Eyes, either surrounded by narrow white rings (material from Greece) or not (some specimens from Turkey). Sternum and legs, uniformly pale yellowish-brown; legs, with numerous spots (missing in some specimens from Turkey). Abdomen, densely covered with dark grey and metallic gold hairs forming an abdominal pattern of cardiac mark and angular lines, pilosity in old individuals occasionally completely abraded.

♂ **Palp** (Fig. 4, 6): Tibial apophyses: VTA, trapeziform, its anterior border oblique; ITA, more or less quandrangular; RTA, slightly curved and pointed (Fig. 4). Cymbium, bulged prolaterally; cymbial process, inconspicuous. Tegulum, circular to ellipsoidal, prolateral-distal side slanting with a small protuberance anterior to embolar base, retrolateral side without projections; retinaculum, visible. Sperm duct, with exceptional strong loop, orientated almost parallel to longitudinal axis of cymbium. Embolus, very long, reaching 90% of cymbium length, crescent-shaped without projection at its base, originating at proximal half of tegulum. Conductor, extended prolaterally.

♀ **Epigyne/vulva** (Fig. 19): epigyne, 1.3 times as wide as long; atrium, more narrow than median plate; sclerotised arch, missing; epigynal folds, almost parallel in anterior half, their tips not pointing inwards; copulatory ducts, slightly bent, comparatively short. Receptacula, egg-shaped, large, half as long as the copulatory ducts. orientated diagonally. separated by half of their diameter. standing anterior to epigastric furrow. Glandular mounds. forming a shallow elevation from ventral view.

Remarks: We failed to identify these specimens with any of the subspecies in CHYZER & KULCZYNSKI (1891) or the species recognized by SEGERS (1992) and by BRAUN

Fig. 28–33: **28**: *Philodromus vagulus* ♀ (Austria, Innsbruck, 20.6.1991). **29**: *Ph. lividus* ♂ (Sardinia, Baunei, 7.6.2003). **30**: *Ph. aureolus* ♂ (Italy, Aurisina, 6.5.1994). **31**: *Ph. collinus* ♀ (Austria, Ötztal, Forchet, 7.6.1992). **32**, **33**: *Ph. cespitum* ♂ (Austria, Innsbruck, 24.6.1992), ♀ (Austria, Kühtai 9.6.1992). Photos: B. KNOFLACH.

(1965). *Philodromus buddenbrocki* (= *Ph. marmoratus*. see below) is similar with its long embolus (BRAUN 1965; JÄGER 1995). but differs distinctly in the following characters: ♂ RTA. straight and slender; ITA. conical; origin of embolus more distal; retrolateral border of tegulum with triangular projection; ♀ epigynal folds diverging anteriorly. Furthermore. *Ph. marmoratus* is a much larger species ("Großform". BRAUN 1965: 405). See also comments on *Ph. bonneti*. From Corfu. which is the type locality of *Ph. lunatus* nov. sp.. another species in this genus was described: *Ph. torquatus* O.P.-CAMBRIDGE 1873. This is close to *Ph. pulchellus* LUCAS 1845 and therefore belongs to another species group (Oxford University Museum of Natural History. type seen).

Distribution (Fig. 27): According to the material examined this species appears to be mainly distributed in the eastern Mediterranean. Most records come from Greece. both from the West (Ionian Islands) and from the East. i.e. Thessalia. but also from Anatolia (Turkey). One further male was discovered in the Roewer collection. labelled „Alpes Maritimes": however. we doubt that its distribution extends so far to the west (see HELVERSEN & MARTENS 1972).

Philodromus marmoratus KULCZYNSKI 1891

Ph. buddenbrocki BRAUN 1965, Senckenbergiana biologica **46**: 403–405, Abb. 79–80.

Comparative material: **Czech Republic**. Moravia: Lednice, 1♂, 29.6.1994, coll. V. BRYJA. **Slovakia**. Latorica, Leles, 1♀, 5–7.6.1960, coll. E. ZDARKOVÁ.

Identification: *Ph. marmoratus*: CHYZER & KULCZYNSKI (1891), KUBCOVA (2004, this volume), terra typica: Northern, western and central Hungary. *Ph. buddenbrocki*: BRAUN (1965), JÄGER (1995), type locality Jekaterinoslaw = Dnjepropetrowsk (Ukraine, ex. coll. THORELL).

Remarks: Unfortunately we did not succeed in tracing the type specimens. For *Ph. marmoratus*, see comments in SEGERS (1992). The specimens of *Ph. buddenbrocki* examined by BRAUN could not be traced, neither in the collection in Stockholm, nor in Geneva or in Frankfurt (KRONESTEDT in litt.). Nevertheless we feel justified in accepting *Ph. buddenbrocki* as a synonym of *Ph. marmoratus*, as already proposed by SEGERS (1992: 24) and by KUBCOVA (this volume). The tibial apophyses in the drawings of BRAUN (1965) and KULCZYNSKI (in CHYZER & KULCZYNSKI 1891) apparently correspond and both descriptions emphasize the large size of the species concerned. Moreover, the recent *Ph. buddenbrocki* record of JÄGER (1995) has considerably extended its range to the west and this species is also mentioned, by JÄGER, from Bulgaria. This putative range apparently overlaps the terra typica of *Ph. marmoratus*, which also was recorded from Sopron, which is near the locality of JÄGER.

Distribution: From Ukraine to the Pannonian part of Austria; probably a Pontic element which is replaced in the true Mediterranean by other congeners.

Philodromus praedatus O. P.-CAMBRIDGE 1871 (Fig. 8, 15, 26)

Material examined: **Algeria**. Bejaia: Tichy, 10 m, 1 ♀, 21.5.1988, leg. BOSMANS (CB). Boumerdes: Reghaia, 45 m, 3♂♂, 13.5.1985, leg. BOSMANS (CB). Chleff: W Damous, 5 m, 1♂, 17.4.1987, leg. BOSMANS (CB). Skikda: W Collo, Tamanart, 25 m, 5♀♀, 6.6.1987, leg. BOSMANS (CB). Tipasa: Bouchaoui, 1♂, 27.5.1988, leg. BOSMANS (CB). **France**. Corse: Calvi, Capo di a Veta Garigue, 180 m, 1♂, 05.5.2001, leg. KNOFLACH & THALER. **Italy**. Southern Tyrol: Bozen/Bolzano, 1♂, 15.7.1989, leg. BOSIN. Toscana: Grosseto, Castiglione della Pescaia, 1♂ 1 ♀ in macchia, 8.6.1987, leg. excursion. Molise: Bojano, 1♂, 7.6.2002, leg. BOSMANS (CB). Sardinia: Baunei, Golgo Plateau, 580 m, 1♂ 1 ♀, 7.6.2003, leg. KNOFLACH & THALER. Cala Gonone, 220 m, 1 ♀, 2.6.2003, leg. KNOFLACH & THALER.

Characterization: species of intermediate size, CW 1.8–2.3; CYL 0.82–1.12 (n = 4), legs with numerous spots. ♂ **Palp** (Fig. 8): Tibial apophyses: anterior border of VTA oblique, slightly concave, its retrolateral corner projecting into a rounded tip; ITA,


31


32


33

hump-shaped; RTA, bladelike, its dorsal border straight, ventral border convex. Cymbium, bulging prolaterally; cymbial process, with inconspicuous, transparent projection. Tegulum, longer than wide, without lateral projections. Loop of sperm duct, diagonal, ascending part diagonal, descending part almost parallel to longitudinal axis of cymbium. Embolus, long, originating at prolateral-distal edge of tegulum, irregularly curved: external tangents forming an almost straight angle, as compared to other species (Fig. 8). Embolar base, projecting. ♀ **Epigyne/vulva**: epigyne, comparatively narrow (1.1 times as wide as long); median plate, slightly wider than atrium; sclerotised arch, faint; epigynal folds, S-shaped. Receptacula, bulbous, small, not longer than 1/3 of the length of the epigynal folds, close to epigastric furrow, usually separated by their diameter. Glandular mounds, inconspicuous.

Remarks: Specimens from the Mediterranean region differ from those of central Europe in some somatic and genital features: they are smaller with relatively shorter cymbium (Fig. 26), carapace stained, RTA less distinctly curved in ventral view, embolus more strongly curved, atrium of epigyne as wide as median plate. Since there is some variation, even within material from central Europe, we nevertheless regard all the specimens as conspecific.

Distribution: Recent records suggest that *Ph. praedatus* is widespread in the western Palaearctic region (PLATNICK 2003). Although this species seems to occur more frequently in temperate zones, in available checklists it is recorded from all the three major Mediterranean peninsulas in southern Europe. Prior to the identification characters provided by MERRETT & SNAZELL (1975), SNAZELL (1976), SEGERS (1990) and HARVEY (1991), *Ph. praedatus* has been confused regularly with other species of this group (see BRAUN 1965; BLICK & SEGERS 1993).

Philodromus vagulus SIMON 1875 (Fig. 28)

Identification: BRAUN (1965).

Material examined: Spain. Gerona: S Puigmal, 1900 m, 1 ♀, 13.7.1991, leg. BOSMANS (CB). Nuria, Traje de las Mulleres, 2200 m, 2 ♀♀, 9.7.1991, leg. BOSMANS (CB).

Remarks: Among its Palearctic relatives, *Ph. vagulus* is unambiguously characterized, in males, by the short retrolateral tibial apophysis, which is wider than long; in females, by the slender median plate of the archless epigyne. This species is mentioned here for comparative purposes, since it probably does not occur in the true Mediterranean region.

Distribution: Endemic to the European mountain system: Alps (MAURER & HÄNGGI 1990; THALER 1997; ZINGERLE 1999; MUSTER 2001), Pyrenees (BOSMANS & DE KEER 1985), Tatras (GAJDOS et al. 1999; already KOCH 1876, sub *Ph. alpestris*), Romania (FUHN & OLTEAN 1970), Balkans (DELTSHEV & BLAGOEV 2001), predominantly in the subalpine belt (THALER 1997).

Discussion

The change in views about the specific status of the taxa distinguished in this group is remarkable: early splitting (SIMON 1875, CHYZER & KULCZYNSKI 1891) was followed by extensive lumping (SIMON 1932) and by splitting again (BRAUN 1965, SEGERS 1992). Admittedly the differences presented by tibial apophyses and epigyne/vulva are minute, but are discrete in view of recent authors and also in our opinion. Moreover, there are other differences, e.g. in its cymbium and tegulum. We found also, the embolus length, the loop of the sperm duct and the size of the receptacula compared to the length of the epigynal folds to be good discriminating characters. We therefore share the viewpoint of the splitters and even felt justified in describing three more southern species to this group. However, characters of pattern and colour are rather vague and ambiguous, with leg spots probably excepted to some degree, and should not be overemphasized. In our material the following species were found to co-exist:

Philodromus	*bos.*	*cesp.*	*fusc.*	*liv.*	*long.*	*lunat.*	*prae.*
aureolus	–	x	x	–	x	–	–
bosmansi		–	x	–	–	–	–
cespitum			–	–	–	–	–
fuscolimbatus				–	x	–	x
lividus					x	–	x
longipalpis						x	x
lunatus							–

Sympatric occurrence seems to be more frequent than supposed by BRAUN (1965: 420), which is an argument for specific status of the taxa involved. We are still convinced that better knowledge of the Mediterranean fauna will contribute to a better understanding of the diversity within this group. Since intraspecific variability also exists in the tibial apophyses, specimens may turn up which still present obvious difficulties for identification, – see also differences between the figures published. As far as variation in size is concerned, we wish to point out that *Ph. praedatus* specimens from Toscana and Corsica are considerably smaller than their conspecifics from central Europe (Fig. 26).

Concerning characters, the following remarks might be added: In the male palpal organ, shape of cymbium and conductor and length of embolus are cleary interrelated. In species with a short embolus, e.g. *Ph. lividus* (Fig. 14), cymbium and conductor are narrow. With increasing length of embolus, a prolateral bulge develops at the cymbium and, also, the conductor broadens to the prolateral side. The origin of the embolus shifts from the prolateral / distal corner of the tegulum to a more proximal position, – see *Ph. lunatus* nov. sp. (Fig. 6). This shift is even more extreme in an American species, *Ph. laticeps* KEYSERLING 1880 (see DONDALE & REDNER 1976: 133). In Figures 6–14, the species investigated are arranged according to embolus length, showing a distinct polarity in this character set. The course of the sperm duct, apparently, reflects both embolus length (and origin) and shape of tegulum. Species with an oblique anterior border of tegulum, such as *Ph. cespitum*, show an asymmetric loop (Fig. 12). The loop opens widely and prolaterally in *Ph. lividus*, a species in which the embolus originates in the most distal position. For the opposite compare *Ph. lunatus* (Fig. 14 vs. 6). Since tibial apophyses are simple, evolutionary trends could not be traced. Since KULCZYNSKI, it has been known that the anterior border of VTA varies from transverse to oblique, with projecting retrolateral corner in some species. ITA varies from a low crest to a stout hump. We did not succeed in typifying in detail, fine differences in shape and orientation of RTA, which is adjacent to cymbium in *Ph. collinus* (Fig. 9) and strongly divergent in *Ph. buchari* (Fig. 7). Neither did we recognise a close correspondence between palpal organ and epigyne/vulva. For example, in *Ph. lunatus* the embolus is longest while copulatory ducts are comparatively short (Fig. 19b). Since we failed to discover a coherent pattern of possible synapomorphies, we do not feel able to propose phylogenetic relationships within the group. Characters of the palp (embolus length, shape of tibial apophyses) neither correspond to each other nor to female characters. This is consistent with the results of a cladistic analysis which was performed with PAUP 4.0b10 (SWOFFORD 2003). Parsimony analysis of a data matrix of 14 taxa (including *Ph. rufus* as outgroup) and 31 morphological characters, using the programs default settings, resulted in four most parsimonious trees of 105 steps. No tree is shown here, because they are highly sensitive to any alterations. For example, the enhancement of tree length by just one step resulted in the collapse of all nodes, thus no clade has a Bremer support value >1.

The lack of a phylogenetic concept seriously impedes reconstruction of biogeographic history. As far we can see at present, the species discussed fall roughly into two main types of distribution. Temperate and even boreal species which are broadly absent in the Mediterranean (*Ph. aureolus, Ph. cespitum, Ph. collinus*) and southern species, which are either expanding (*Ph. buxi, Ph.*

longipalpis?) or stationary Mediterranean, being present in the whole Mediterranean (*Ph. fuscolimbatus*), or in its western region (*Ph. bosmansi* nov. sp., *Ph. lividus*) or eastern region only (*Ph. krausi* nov. sp., *Ph. lunatus* nov. sp.). Two species do not fit into this system: *Ph. marmoratus* is an eastern species with Pontic range, and *Ph. vagulus*, an oreal element, confined to the Alpine mountain system. For lack of conclusive information we hesitate to assign *Ph. buchari* and *Ph. praedatus* to any of these chorological types.

On the Macronesian islands no member of the *Ph. aureolus* group has been recorded (WUNDERLICH 1991). Could this be an argument to assume that these species were absent in ancient laurisilva? If we accept this hypothesis, this group might have existed primarily in the temperate zone. The species now living in the Mediterranean might have evolved from northern invaders which became trapped during cryocratic periods in southern refugia, thus allowing speciation. In the Nearctic, the *Ph. aureolus* group comprises 12 species (DONDALE 1976), most of them forming a distinct subgroup characterised by a bifid RTA. The only species occurring in both continents is *Ph. cespitum*, which is probably due to its ability to survive in northern latitudes (PALMGREN 1983). This species therefore might have extended its range to America via Beringia. Apparently our view differs greatly from the phylogenetic concept proposed by BRAUN (1965: fig. 100). In our opinion some of the difficulties experienced by CHYZER & KULCZYNSKI (1891: 108) by dealing with this group are still crucial today: "Cohors Philodromi aureoli formas comprehendit non paucas, quae quum inter se plerumque non solum colore sed etiam partium genitalium structura different, certo pro subspeciebus, sive speciebus nascentibus, potius quam pro fluxis varietatibus haberi debent, quamquam discrimina et exigua et non constantia sunt". [Our translation: The group of *Ph. aureolus* includes quite a number of forms, which differ not only in pattern, but also in the structure of their genital organs. They should be regarded therefore as cryptic species, rather than as mere varieties, even if their differences are subtile and not always stable].

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Zusammenfassung

Neue Arten und Nachweise von Laufspinnen (Arachnida, Araneae, Philodromidae) aus dem Mittelmeerraum: I. *Philodromus aureolus* Gruppe. Im Mittelmeerraum treten 13 von 15 der in der W-Paläarktis vorkommenden Arten der *Philodromus aureolus* Gruppe auf. Darunter befinden sich drei als neu beschriebene Arten: *Ph. bosmansi* nov. sp., *Ph. krausi* nov. sp. und *Ph. lunatus* nov. sp. Demnach wurde die Diversität dieser Gruppe in der Mediterraneis bisher unterschätzt, doch sind diese Verhältnisse essentiell für ein Verständnis der Vielfalt, der intraspezifischen Variabilität bzw. der interspezifischen Variation in Mitteleuropa. Die Arten werden abgebildet und besprochen und ein Bestimmungsschlüssel wird vorgeschlagen. Die meisten Spezies sind in S-Europa weitverbreitet, doch weisen manche nur eine eingeschränkte Verbreitung auf: *Ph. lividus* im westl., *Ph. lunatus* nov. sp. im östl. Mittelmeerraum, *Ph. krausi* nov. sp. in Kleinasien und *Ph. bosmansi* nov. sp. in Algerien, Atlas. Die Arten des gemäßigten Europa (*Ph. aureolus*, *Ph. cespitum*, *Ph. collinus*, *Ph. vagulus*) treten im Mittelmeerraum nur sehr zerstreut in größerer Höhe auf. Die systematischen Zusammenhänge der Artengruppe konnten nicht aufgelöst werden. Zwei neue Synonyme werden vorgeschlagen: *Ph. collinus istricus*

BRAUN 1965 = *Ph. collinus* C. L. KOCH 1835; *Ph. aureolus rufolimbatus* KULCZYNSKI 1891 = *Ph. fuscolimbatus* LUCAS 1846.

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Addresses of the authors:

Dr. Christoph MUSTER
Staatliche Naturhistorische Sammlungen
Museum für Tierkunde
Königsbrücker Landstrasse 159
D-01109 Dresden, Germany
E-Mail: christoph.muster@uibk.ac.at

Univ.-Doz. Dr. Konrad THALER
Institut für Zoologie und Limnologie der
Universität Innsbruck
Technikerstraße 25
A-6020 Innsbruck, Austria
E-Mail: konrad.thaler@uibk.ac.at